CALFED BAY-DELTA PROGRAM
ECOSYSTEM RESTORATION PROGRAM PLAN

OVERVIEW

The mission of the CALFED Bay-Delta Program is to develop a long-term comprehensive plan that will restore ecosystem health and improve water management for beneficial uses of the Bay-Delta system. The Program addresses problems in four resource areas: ecosystem quality, water quality, levee system integrity, and water supply reliability. Programs to address problems in the four resource areas have been designed and integrated to fulfill the CALFED mission.

Ecosystem goals presented in the *Strategic Plan for Ecosystem Restoration* will guide the Ecosystem Restoration Program (ERP) during its implementation phase. Strategic Goals include the following:

1. Achieve recovery of at-risk native species dependent on the Delta and Suisun Bay as the first step toward establishing large, self-sustaining populations of these species; support similar recovery of at-risk native species in the Bay-Delta estuary and the watershed above the estuary; and minimize the need for future endangered species listings by reversing downward population trends of native species that are not listed.

2. Rehabilitate natural processes in the Bay-Delta estuary and its watershed to fully support, with minimal ongoing human intervention, natural aquatic and associated terrestrial biotic communities and habitats, in ways that favor native members of those communities.

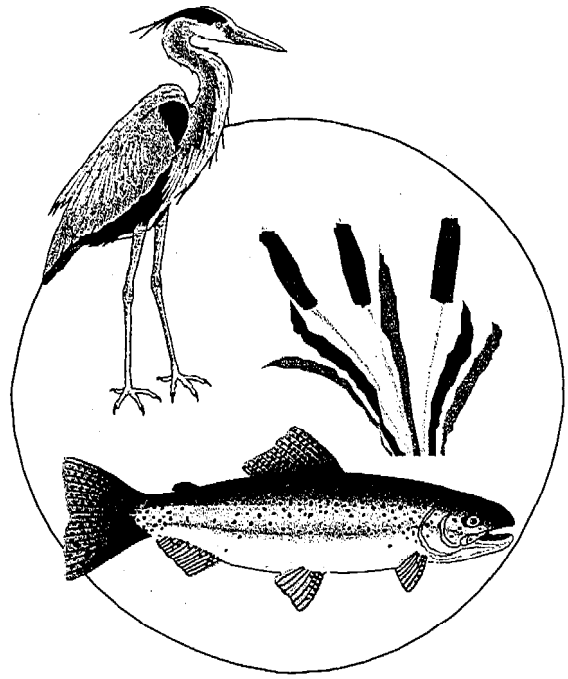
3. Maintain and/or enhance populations of selected species for sustainable commercial and recreational harvest, consistent with the other ERP strategic goals.

4. Protect and/or restore functional habitat types in the Bay-Delta estuary and its watershed for ecological and public values such as supporting species and biotic communities, ecological processes, recreation, scientific research, and aesthetics.

5. Prevent the establishment of additional non-native invasive species and reduce the negative ecological and economic impacts of established non-native species in the Bay-Delta estuary and its watershed.

6. Improve and/or maintain water and sediment quality conditions that fully support healthy and diverse aquatic ecosystems in the Bay-Delta estuary and watershed; and eliminate, to the extent possible, toxic impacts to aquatic organisms, wildlife, and people.

The ERP addresses these Strategic Goals by restoration of ecological processes associated with streamflow, stream channels, watersheds, and floodplains. These processes create and maintain habitats essential to the life history of species dependent on the Delta. In addition, the Program aims to reduce the effects of stressors that inhibit ecological processes, habitats, and species.



ORGANIZATION OF THE PLAN

The ERP comprises three volumes: a Strategic Plan and the two volume restoration plan.

- Strategic Plan for Ecosystem Restoration
- Volume I: Ecological Attributes of the San Francisco Bay-Delta Watershed
- Volume II: Ecological Management Zone Visions.

STRATEGIC PLAN FOR ECOSYSTEM RESTORATION is the guidance document for implementing the Ecosystem Restoration Program Plan. It defines an ecosystem-based approach that is comprehensive, flexible, and iterative, designed to respond to changes in the complex, variable Bay-Delta system and changes in the understanding of how this system works. The Strategic Plan also presents broad strategic goals and objectives and establishes "Adaptive Management" as the primary tool for achieving ecosystem restoration objectives. The Strategic Plan describes how conceptual models should be used in developing restoration programs and defining information needs. Note: The Strategic Plan for Ecosystem Restoration (2000) is derived from the Strategic Plan for the Ecosystem Restoration Program (1998).

VOLUME I: ECOLOGICAL ATTRIBUTES OF THE SAN FRANCISCO BAY-DELTA WATERSHED presents the visions for ecological processes and functions, fish and wildlife habitats, species, and stressors that impair the health of the processes, habitats, and species. The visions presented in Volume I are the foundation of the ERP and display how the many ecosystem elements relate to one another and establish a basis for actions which are presented in Volume II.

VOLUME II: ECOLOGICAL MANAGEMENT ZONE VISIONS presents the visions for the 14 ecological management zones and their respective ecological management units. Each individual ecological management zone vision contains a brief description of the management zone and units, important ecological functions associated with the zone, important habitats, species which use the habitats, and stressors which impair the functioning or utilization of the processes and habitats. Volume II also contains strategic objectives, targets, programmatic actions, and conservation measures which describe the ERP approach, and which balances and integrates the needs of the Multi-Species Conservation Strategy (2000) in order to improve the ecological health of the zone and its contribution to the health of the Delta. Rationales are also contained in Volume II which clarify, justify, or support the targets and programmatic actions.

INTRODUCTION TO VOLUME I

Volume I contains information related to problems, theory, and concepts linked to the Central Valley ecosystem and includes descriptions of important ecological processes and functions, habitats, species, and stressors which impair or otherwise adversely effect the other ecosystem elements (Figure 1). Individually and cumulatively, the visions for the ecosystem elements establish the foundation and scientific basis of the ERP. Volume I also incorporates important elements from the Multi-Species Conservation Strategy (2000) such as standardized species designation, conservation measures for evaluated species, and species goal prescriptions.

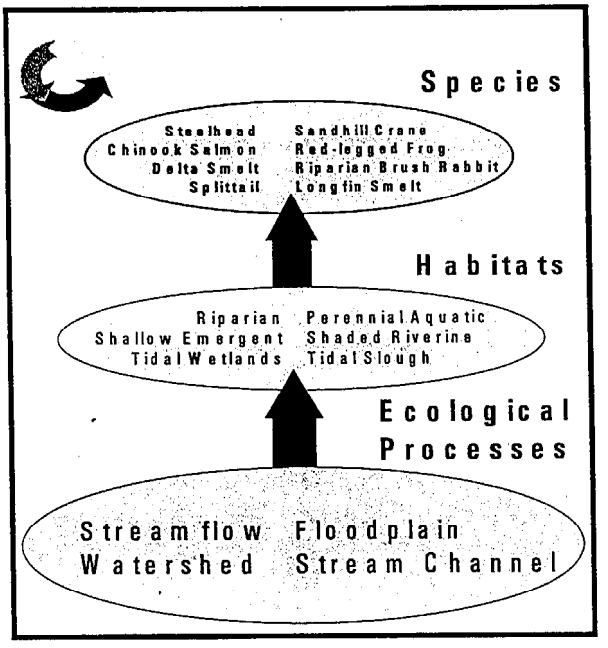


Figure 1. Relationship of ecological processes, habitats, and species in the Ecosystem Restoration Program Plan.

Each section follows the same format and begins with introductory information regarding the ecosystem elements. Three introductory tables summarize the strategic objectives, basis for selection as an ecosystem

element, and the distribution of ecosystem elements by ecological zone.

Individual visions begin with an introduction followed by a description of the relevant process, habitats, species, or stressors. These are followed by the ERP vision for the element, how restoration of the process, habitat, or species, or reduction or elimination of the stressor integrates with other ongoing restoration or management programs. The relationship or linkage of the ecosystem elements to other elements is then discussed followed by a presentation of the strategic objective, targets, narrative summary of programmatic actions, and MSCS conservation measures which provide additional detail to the programmatic actions.

PERSPECTIVE

The ecological hub of the Central Valley is the Sacramento-San Joaquin Delta and Bay. The ERP signals a fundamental shift in the way ecological resources of the Central Valley are managed. For many decades, government entities, non-profit organizations, and the private sector have engaged in managing, protecting, regulating, and in some cases propagating fish and wildlife species of the Bay and Delta - yet many populations have not recovered sufficiently and remain in decline. In spite of constant human intervention to repopulate fish and wildlife that have commercial, recreational, and biological importance to society (e.g., hatchery programs and expensive re-engineered water diversions), populations have not been sustained at stable, healthy levels that support historic use of those resources.

Historic efforts of individual species regulation and management will be replaced by an integrated systems approach that aims to reverse the fundamental causes of decline in fish and wildlife populations. A systems approach will recognize the natural forces that created historic habitats and use these forces to help regenerate habitats. The Bay-Delta ecosystem is not simply a list of species. Rather, it is a complex living system sustained by innumerable interactions that are physical, climatic, chemical, and biological in nature, both within and outside of the geographic boundaries of the Delta.

The ERP is fundamentally different from many past efforts in another way as well. It is not designed as mitigation for projects to improve water supply reliability or to bolster the integrity of Delta levees; improving ecological processes and increasing the amount and quality of habitat are co-equal with other program goals related to water supply reliability, water quality, and levee system integrity. Solving serious and long-standing problems in each of these resource areas will require an ambitious, integrated, long-term program. We do not know the balance needed between restoration efforts in the Delta and Bay and restoration efforts upstream. However, aquatic species cannot be the sole driving force for ecosystem restoration. Ecosystem restoration must involve the integration of the needs of terrestrial and aquatic species and plant communities.

The central theme of the ERPP is the recognition that truly durable and resilient populations of fish and wildlife inhabiting the Bay and Delta require, above all else, the rehabilitation of ecological processes throughout the Central Valley river and estuary systems and watersheds.

The ERP, like all components of Bay-Delta solution alternatives, is being developed and evaluated at a programmatic level. The complex and comprehensive nature of a Bay-Delta solution means that it will necessarily be composed of many different programs, projects, and actions that will be implemented over time. During the current phase of the Program, solution alternatives have been evaluated as sets of programs and projects and broad benefits and impacts have been identified. In the implementation phase of the Program, more focused analysis, environmental documentation, and implementation of specific programs and actions will occur. The CALFED goal for ecosystem quality will be achieved by further developing and adhering to the *Strategic Plan for Ecosystem Restoration*. A major effort toward reaching target levels will be emphasized during the first 7 years of the implementation program. Special effort will be directed to actions that can be implemented to restore ecological processes. The restoration of these processes is intended to restore and maintain habitats, and to provide for the needs of the species dependent on a healthy Bay-Delta system. For example, restoring stream channels contributes to sediments, nutrients, and a variety of

habitats. The strategy recognizes that not all processes can or should be completely restored and that intervention, manipulation, and management will be required. For example, streambed gravel may have to be introduced, habitats may have to be constructed, and vegetation planted. Still, an important part of the approach is to recommend measures that in the long-term will limit the need for continued human intervention.

Implementation of the ERP is further guided by the recognition that all landscape units and physical and biological components of the ecosystem are interdependent and dynamic. Interdependence means that actions and stressors in one part of the system can and do affect populations and conditions that may be separated by hundreds of miles (e.g., in watersheds and spawning tributaries), or affect the food web in ways that may not be felt for several years.

Natural systems are dynamic; i.e., they are characterized by response to cycles of change and episodic catastrophes that are driven by natural or human factors. Most habitats undergo expansions and contractions, or shifts in space and time. The dynamic nature of healthy habitats is the cause of much biological diversity, and complex habitats tend to make species populations more resilient to change. If the mosaic of habitats distributed across a broad landscape is complex, and if large areas of habitat are connected by smaller patches and corridors such as those associated with riparian systems, then healthy areas of the ecosystem can be relied upon to sustain species during temporary setbacks in other areas.

GEOGRAPHIC SCOPE

The geographic (spatial) scope of the ERP is defined by the interdependence and linkage of the ecological zones which encompass the Central Valley. These ecological zones include the upland river-riparian systems, alluvial river-riparian systems, the Delta, and Greater San Francisco Bay (Note: These ecological zones are more fully described in the section on Key Ecological Attributes of the San Francisco-Bay Delta Watershed which follows this section). The geographic scope defines the locations where actions might be implemented to maintain, protect, restore, or enhance important ecological processes, habitats, and species. Some rivers or watersheds have ecological attributes which are valued higher than the attributes of others areas. These ecological values include the condition of important ecological processes and how well they support a diversity of habitats and biotic communities. The communities include the fish, wildlife, and plants which occupy or utilize the habitats within these local areas.

The species addressed in the ERP depend on habitat conditions in Suisun Bay, the Delta, Sacramento River, San Joaquin River, and many of their tributary streams. For these reasons, the primary geographic focus of the ERP is the Sacramento-San Joaquin Delta, Suisun Bay, the Sacramento River below Shasta Dam, the San Joaquin River below the confluence with the Merced River, and their major tributary watersheds directly connected to the Bay-Delta system below major dams and reservoirs. In addition, streams such as Mill Creek, Deer Creek, Cottonwood Creek, and Cosumnes River, are emphasized due to their free-flowing status and relative high quality of habitats and ecological processes.

Secondarily, the ERP addresses, at a broader, programmatic level, Central and South San Francisco Bay and their local watersheds (Note: The primary geographic focus area for the ERP can be divided into 14 management zones, each characterized by a predominant physical habitat type and species assemblage, Figure 2). These 14 ecological management zones constitute the geographic areas in which the majority of restoration actions will occur. The upper watersheds surrounding the primary focus area are important and addressed through general actions that focus on watershed processes and watershed planning, management and restoration. The CALFED Watershed Program addresses the coordination of planning and restoration actions in the upper watershed

MULTI-SPECIES CONSERVATION STRATEGY

CALFED has developed a Multi-Species Conservation Strategy (MSCS) to serve as the framework for compliance with the Federal Endangered Species Act (FESA), the California Endangered Species Act (CESA), and the State's Natural Community Conservation Planning Act (NCCPA) (Multi-Species

Conservation Strategy 1999). The Conservation Strategy has identified a subset of species which are federally and State listed, proposed, or candidate species, other species identified by CALFED that may be affected by and for which the CALFED Program and the ERP have responsibility related to (1) recovery of the species, (2) contribute to their recovery, or (3) maintain existing populations.

IMPLEMENTATION STRATEGY

A large and diverse ecosystem like the Bay-Delta is extremely complex. There are many processes and relationships at work in the ecosystem that are not fully understood. Thus, there are many difficulties and uncertainties associated with a program to improve ecosystem health. In some cases, problems are well understood and the steps to improvement are clear. In other cases, there is some understanding of the reasons for decline but this understanding is not sufficient to warrant full-scale implementation of remedial measures. In still other cases, additional research is needed before solutions can be identified with certainty.

The difficulties and uncertainties of ecosystem restoration call for an implementation strategy that is flexible and can accommodate and respond to new information. The foundation of the ERP implementation strategy is adaptive management. Adaptive management is a process of testing alternative ways of meeting objectives, and adapting future management actions according to what is learned. Adaptive management relies upon the identification of indicators of ecosystem health, comprehensive monitoring of indicators to measure

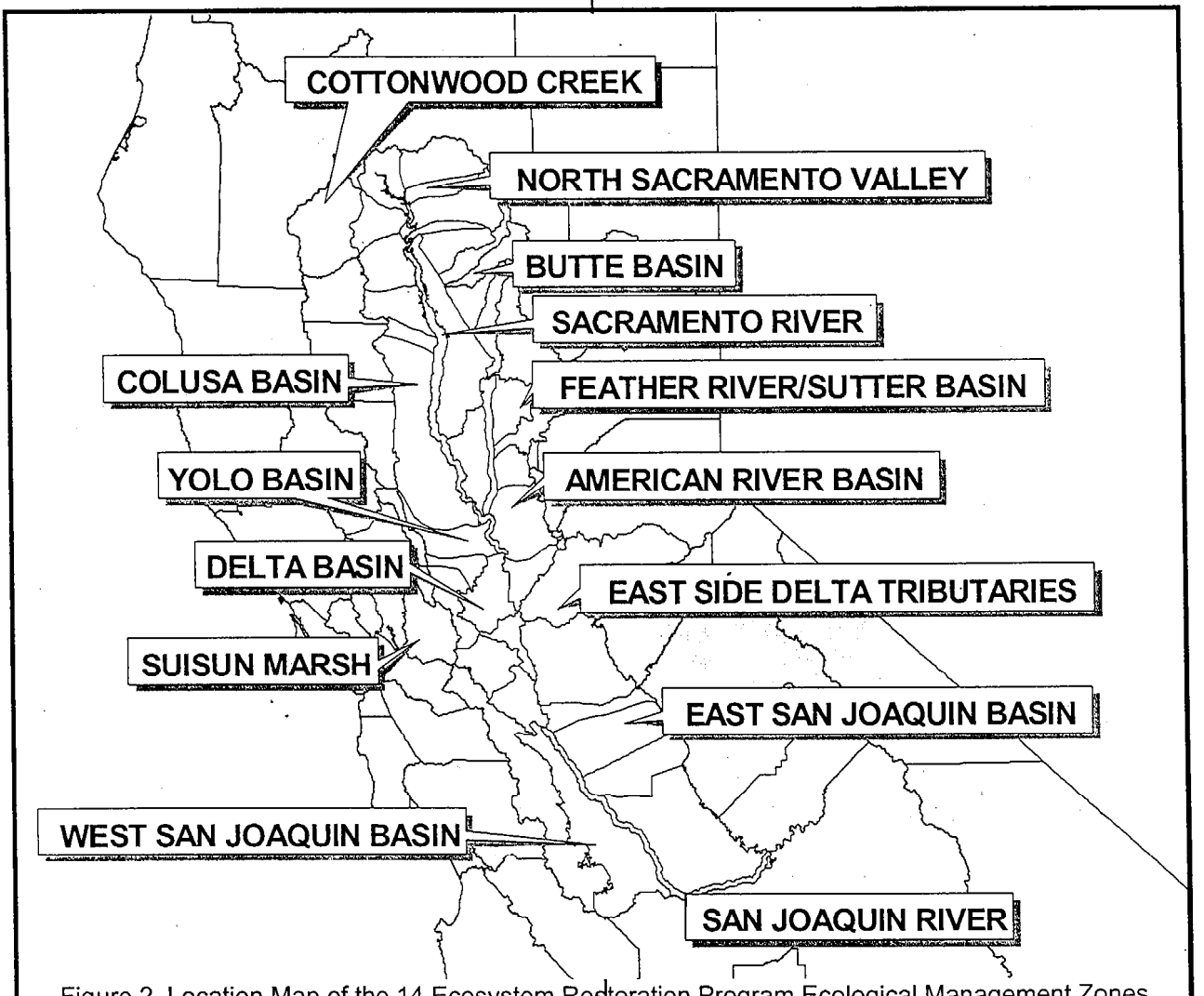


Figure 2. Location Map of the 14 Ecosystem Restoration Program Ecological Management Zones

improvement over time, focused research, and phasing of actions.

INDICATORS are quantitative measures of ecosystem attributes or elements that are expected to change over time in response to implementation of the ERP. Indicators are selected to provide measurable evaluations of important ecological processes, habitats, and species whose status individually and cumulatively provide an assessment of ecological health. Indicators of ecosystem health are the gauges we will use to measure progress toward the goal. Some indicators are very broad in scale while others are very specific. For example, a very broad or landscape level indicator of ecosystem health might be a comparison of the total area of riparian forest to historic coverage or an evaluation of the average distance between patches of such forest with closer patches indicating better health than more distant patches. A more specific indicator might be the concentration of toxic substances in the flesh of adult striped bass.

COMPREHENSIVE MONITORING is the process of measuring the abundance, distribution, change or status of indicators. For example, contaminant concentrations in fish tissues can be measured at various locations and times in the system to determine if contaminant levels are changing. This will allow progress to be measured, allow actions to be modified if necessary, and provide assurances that the restoration objectives are being achieved. (Note: A Comprehensive Monitoring, Assessment, and Research Program is being developed. A description of that program is presented later in this section.)

DIRECTED RESEARCH will help answer questions about the system and its components and increase the certainty surrounding the relationships of ecological processes, habitats, and species. For example, the relationships among streamflow, storm events, flow-related shaping of river channels to modify habitat, and the physical and chemical signals that flow provides for aquatic species all need to be better understood for effective management of the system.

STAGED IMPLEMENTATION is the logical sequence of implementing restoration actions to achieve CALFED goals as effectively as possible. Staging will consider all targets and programmatic actions and will be used to prioritize actions. For example, actions directed at recovering endangered species and which are consistent with the long-term restoration program and contribute to ecological resilience have a high priority.

Stage I is defined as the first 7 years of program implementation and will include restoration of ecological processes and habitats that are most important for endangered species recovery, reduction of stressors that affect threatened and endangered species, and other actions that may reduce conflicts between beneficial uses in the system. Later implementation stages will be shaped through adaptive management by the results of restoration actions in the first 7 years of the program.

The ERP will be refined and implemented according to the steps listed below.

1. **REFINE THE ERP** based on broad public participation, and using the best scientific knowledge currently available in the short term.
2. **CREATE AN ECOSYSTEM SCIENCE PROGRAM** to provide ongoing scientific evaluation of the ERP. The Science Program will be a collaborative effort among local and national, independent stakeholder and agency scientists and technical experts convened to address outstanding scientific issues and review the ERP.
3. **PREPARE CONCEPTUAL MODELS** to describe the Bay-Delta ecosystem and the proposed actions of the ERP. Restoration or rehabilitation programs for complex ecosystems must be based on clear concepts about how the system is believed to function, how it has been altered or degraded, and how various actions might improve conditions in the system. Conceptual models can provide a basis for quantitative modeling or identify critical information needs for research or monitoring. In ecosystem restoration, they can be used to link human activities or management actions to outcomes important to society. In adaptive management, the most important uses of conceptual models are for: linking human activities to valued outcomes, highlighting key uncertainties where research or adaptive probing might be necessary, and identifying monitoring needs.

4. **DEVELOP TESTABLE HYPOTHESES** for proposed ERP actions. The hypotheses underlying the ERP will be tested through experiments using the conceptual models and on-the-ground research. The results from these experiments will feed back into the adaptive management process and will support proposed actions, suggest revisions to actions, and identify needs for further research.

5. **CONDUCT IMMEDIATE DIRECTED RESEARCH** to improve understanding of the ecosystem and the causes of problems identified in the conceptual models and testable hypotheses. Use results from short-term studies to adjust the way that objectives are achieved, making refinements to the final ERP targets, actions, and implementation schedule.

6. **DEVELOP AND BEGIN A STAGED IMPLEMENTATION PROGRAM THAT ENTAILS:**

- short-term implementation of ecosystem restoration demonstration projects (e.g., through the CALFED Restoration Coordination Program and related programs), including stressor reduction measures, to help threatened populations begin recovering and to test the viability and effectiveness of targets and actions,
- coordinated monitoring, evaluation, and reporting of the results of recovery efforts, and the status of ecological indicators in the Bay-Delta and other zones, and
- adaptive management of each successive stage of ERP implementation, including pragmatic adjustments to ecosystem targets, funding priorities, and restoration techniques to ensure that public and private resources are well spent and complement other related efforts.

During refinement and implementation of the ERP, public accountability and program effectiveness will be assured through continuing public involvement as well as environmental impact analysis and documentation.

COMPREHENSIVE MONITORING, ASSESSMENT, AND RESEARCH PROGRAM

The CALFED Bay-Delta Program is organized around the concept of adaptive management because there is incomplete knowledge of how the ecosystem functions and the effects of individual project actions on populations and processes. Monitoring key system functions (or indicators), completing focused research to obtain better understanding, and staging implementation based on information gained are all central to the adaptive management process. The process necessarily includes numerous assessment and feedback loops so that management decisions are based on the best and most current information. This process entails an institutional framework to ensure that the correct questions are identified for monitoring and research actions, that monitoring and research are conducted appropriately, that the data collected and obtained are stored properly and available to those with an interest, and that relevant information is developed from the data obtained to further the incremental process of adaptive management. The Comprehensive Monitoring, Assessment and Research Program (CMARP) is being developed to meet these needs.

A substantial monitoring effort in the Bay and Delta has been carried out for many years under the auspices of the Interagency Ecological Program (IEP). The purpose of the CMARP is to build on the work of IEP and other efforts to assure that information gathering and evaluation necessary to the success of the CALFED Program is developed and carried out. CMARP will help provide those new facts and scientific interpretations necessary for implementing the CALFED Program and for the public to judge the Program's success. Major efforts will include documenting and explaining the status and trends of the resources, providing timely information for real-time management, and participating in design, execution, and analysis of adaptive experiments. CMARP must routinely make available information on major indicators of program progress. CMARP efforts must be subjected periodically to independent scientific review to evaluate the Program's relevance and approach and to maintain public confidence in the Program.

CMARP Scope

CMARP is designed to provide information on all of the CALFED program elements, including the Ecosystem Restoration Program, the Multi-Species Conservation Strategy, Water Quality Program, Levee Program, Water Use Efficiency Program, Water Transfer Program, Storage, Conveyance, and the Watershed Program. CMARP also has responsibility for organizing and evaluating data generated by projects of the Restoration Coordination Program. In addition, CMARP will contribute to the design of monitoring for any mitigation efforts of CALFED. Finally, CMARP will be coordinated with existing monitoring and research programs so that they can provide a foundation of information for the Program. The CMARP will include options to ensure that monitoring, assessment, and research needs are:

- identified
- coordinated to provide comprehensive system-wide coverage
- performed by the most appropriate party
- completed in a comparable manner by all parties
- accomplished with minimum redundancy and optimum efficiency and effectiveness.

The CMARP must also ensure that results from the monitoring are:

- interpreted
- made readily available to all interested parties in a timely manner
- incorporated as feedback to facilitate adaptive management.

CMARP must also assure that study and monitoring designs are sufficient to detect statistically significant and ecologically relevant impacts or changes.

The scope of CMARP includes both institutional and environmental considerations. It seeks to balance specific knowledge needs of water managers and the public versus an understanding of ecosystem processes and what can actually be obtained and measured from the field. For example, CALFED agencies presently monitor the abundance of several key species and environmental attributes such as streamflow at the State and federal diversion facilities in the Delta to understand better which species are entrained, when, how many, during what life stage and under what kind of environmental conditions. Although much of this monitoring is designed to address institutional needs, limits on knowledge obtained are based on limitations of monitoring design which in turn are limited by the physical system to be monitored. Thus, the programmatic scope of CMARP must consider both institutional needs and environmental considerations and should maintain sufficient flexibility to respond to both as they change over time.

CALFED has determined that monitoring, assessment, and research efforts are a critical component of the adaptive management process, and should be integral to all program elements. The application of CMARP will be very different for individual CALFED programs. However, each program element has similar needs that include gathering and assessing data. In addition, the CMARP must also address the monitoring and assessment needs of the CALFED Conservation Strategy, as well as any mitigation required as a result of CALFED program actions.

Restoration/rehabilitation projects require special consideration. A requirement for funding is that project proposals contain monitoring elements to determine if stated objectives have been met and to provide guidance for assessing future restoration/rehabilitation needs. CMARP will include recommendations to ensure that monitoring data from all these projects are technically sound, broadly usable, and provide meaningful information to guide future actions.

The CMARP Plan will take into consideration the broad variety of factors that can affect the environment, its physical structure, chemical makeup and biotic communities. The recommended program will necessarily be limited to monitoring only a small fraction of the possible physical chemical, and biological attributes of the environment. Conceptual modeling will play a key role in helping decide which attributes to monitor.

CMARP Objectives

Objectives have been established for CMARP's monitoring and assessment and research functions that are consistent with the adaptive management strategy adopted by CALFED.

MONITORING AND ASSESSMENT PROGRAM OBJECTIVES

- Provide information necessary to management necessary to evaluate the effectiveness of program actions and to support ongoing adaptive management actions.
- Describe conditions in the Bay-Delta and its watershed on appropriate temporal and spatial scales.
- Evaluate trends in the measures of environmental conditions.
- Identify the major factors that may explain the observed trends.
- Analyze data and report results to stakeholders and agencies on a timely basis.

RESEARCH PROGRAM OBJECTIVES

- Build an understanding of physical, chemical and biological processes in the Bay-Delta and its watershed that are relevant to CALFED program actions.
- Provide information useful in evaluating the effectiveness of existing monitoring protocols and the appropriateness of environmental attributes.
- Test causal relationships among environmental variables identified in conceptual models
- Reduce areas of scientific uncertainty regarding management actions.
- Incorporate relevant new information from all sources.
- Revise conceptual models as understanding of the system increases.

CMARP PROGRAM ACTIVITIES

The CMARP development process has included the following steps:

1. **IDENTIFY THE GOALS, OBJECTIVES AND NEEDS** of CALFED Program elements, related programs, and agency major program goals and objectives.
2. **DEVELOP A CONCEPTUAL FRAMEWORK** that focuses on development of explicit conceptual models for use in designing monitoring and research programs. (This task is being accomplished in coordination with monitoring and research programs from Puget Sound, Chesapeake Bay and South Florida).
3. **MONITORING PROGRAM DESIGN**
   - Inventory existing monitoring programs
   - Develop monitoring elements
   - Develop a process for data management
   - Develop a process for data analysis and monitoring
   - Restoration coordination monitoring institutional process
4. **DESIGN A CALFED FOCUSED RESEARCH PROGRAM** to investigate causes and trends, reduce areas of scientific uncertainty, and corroborate relationships in conceptual models.
5. **DEVELOP AN INSTITUTIONAL STRUCTURE FOR MONITORING, ASSESSMENT AND RESEARCH** to focus on identifying institutional functions, and recommending how a monitoring and research program should operate. The *CMARP Program Report*, a separate appendix to this *Programmatic EIS/EIR*, recommends that there be a chief scientist, a science coordination team, and a science review board.

CALFED recognizes the need for reducing uncertainties about the factors affecting the resources of the Bay-Delta system. Although a traditional monitoring, assessment and research program will meet this need over a period of decades, CALFED needs to reduce key uncertainties at a more rapid rate to meet program goals. Therefore, CALFED will undertake an active program of adaptive resource management. Such a program will require a partnership between resources managers and scientists in which effects of key factors are better defined by informed management experiments. Resource managers will thereby increase chances of avoiding catastrophes and responding successfully to unexpected events. Informed adaptive experiments require policy-level recognition and acceptance of some risks to the resources.

TERMS USED IN THE ERPP

The following terms are used in the ERP:

CONSERVATION MEASURE: Two types of conservation measures were developed under the MSCS: 1) measures designed to avoid, minimize, and compensate for CALFED's adverse effects on NCCP communities and evaluated species (applicable to species with "R," "r," and "m" conservation goals; and 2) measures to enhance NCCP communities and evaluated species that are not directly linked to CALFED's adverse impacts. The conservation measures presented in Volume 1 and Volume II of the ERP are the latter type: conservation measures to enhance NCCP communities and evaluated species.

ECOSYSTEM-BASED MANAGEMENT: Ecosystem-based management is a resource management concept of achieving species management objectives by sustaining and enhancing the fundamental ecological structures and processes that contribute to the well being of the species. A basic tenet of CALFED's implementation of ecosystem-based management is, to the extent feasible, to restore or rehabilitate the natural processes that create and maintain the important elements of ecosystem structure. Ecosystem-based management differs fundamentally from the more traditional approach of species-based management, which seeks to manipulate specific environmental factors (e.g., direct removal of predators from the environment to reduce predation levels on the target species) thought to be limiting target species populations at levels below management objectives.

ECOSYSTEM ELEMENT: An ecosystem element is a basic component or function which, when combined with other ecosystem elements, make up an ecosystem. An ecosystem element can be categorized as a process, habitat, species, species community, or stressor.

ECOSYSTEM REHABILITATION: Within CALFED's concept of ecosystem restoration, the ERP will largely focus on ecosystem rehabilitation. In the context of CALFED, ecosystem rehabilitation is defined as the process by which resource managers reestablish or refurbish key elements of ecological structure and function within the Bay-Delta ecosystem to a level necessary to achieve ERP goals and objectives.

ECOSYSTEM RESTORATION: Ecosystem restoration is a term sometimes used to imply the process of recreating the structural and functional configurations of an ecosystem to that present at some agreed to time in the past. Because the structure and function of many elements of the Bay-Delta ecosystem have been severely disrupted and cannot be feasiblely restored to a specified historic condition, within the context of CALFED, ecosystem restoration is more realistically defined as the process by which resource managers ensure that the capacity of the ecosystem to provide ecological outcomes valued by society is maintained, enhanced, or restored.

ECOLOGICAL PROCESS: Ecological processes act directly, indirectly, or in combination, to shape and form the ecosystem. These include streamflow, stream channel, and floodplain processes. Stream channel processes include stream meander, gravel recruitment and transport, water temperature, and hydraulic conditions. Floodplain processes include overbank flooding and sediment retention and deposition.

HABITATS: Habitats are areas that provide specific conditions necessary to support plant, fish, and wildlife communities. Some important habitats include gravel bars and riffles for salmon spawning, winter seasonal floodplains that support juvenile fish and waterbirds, and shallow near-shore aquatic habitat shaded by overhanging tule marsh and riparian forest.

LONG- AND SHORT-TERM OBJECTIVES: Objectives can be both short-term and long-term. Short-term objectives should be clearly feasible, relatively easy to measure, and achievable in reasonable length of time (usually less than 25 years). The time period is not the same as Stage I of the CALFED process. Long-term objectives may be more difficult to determine and require additional resources and knowledge to achieve. (Note: these differ from Strategic Objectives which are defined later in this section.)